



THE GARDEN STATE

Dr. Robert H. Daines observing effects of new fungicides, including SR-406 (or Captan) on potted bean plants in laboratory. BELOW: Dr. William H. Martin, dean of the Rutgers College of Agriculture and Experiment Station director, wades into ear of corn at farm luncheon. He's the Station's fourth director.



Dairy (left) and Administration Buildings on the Agricultural College

SCIENTISTS of the SOIL

BY LEGEND and by axiom the farmer stays happy and healthy (and occasionally even wealthy) because he's early to bed and early to rise, because he makes hay while the sun shines, and in general retains all the old Farmer's Almanac virtues. Maybe so, but in 1955 a new maxim seems more fitting: Ye shall reap as ye shall research.

Nowhere is that more applicable than in New Jersey, where the farmer must wring every possible dollar out of his high-priced land. The farmer lives and thrives on research,

opportunity to attend the celebration—from those many farmers who have learned the value of a new Rutgers insecticide, a new Rutgers apple, or a new Rutgers information bulletin.

Years have a nice way of settling any facility in place. The Experiment Station can recall with pride such internationally famed projects as the early pioneering in soil science, the unparalleled ventures in peach breeding, the development of the great Rutgers tomato, the perfection of splendid chicken vaccines, the first scientific development of the nation's oyster beds, the establishment of

By John T. Cunningham

one crop never likely to be in surplus supply in the Garden State or any other agricultural area.

Long gone is the day when farmers scoffed at those "professor fellows" who insisted that agriculture was a science rather than a backbreaking way of life. In this age of progress a man on the farm listens to researchers or he collapses. Such listening in New Jersey means farm ears cocked in the direction of New Brunswick and the Agricultural Experiment Station at Rutgers University.

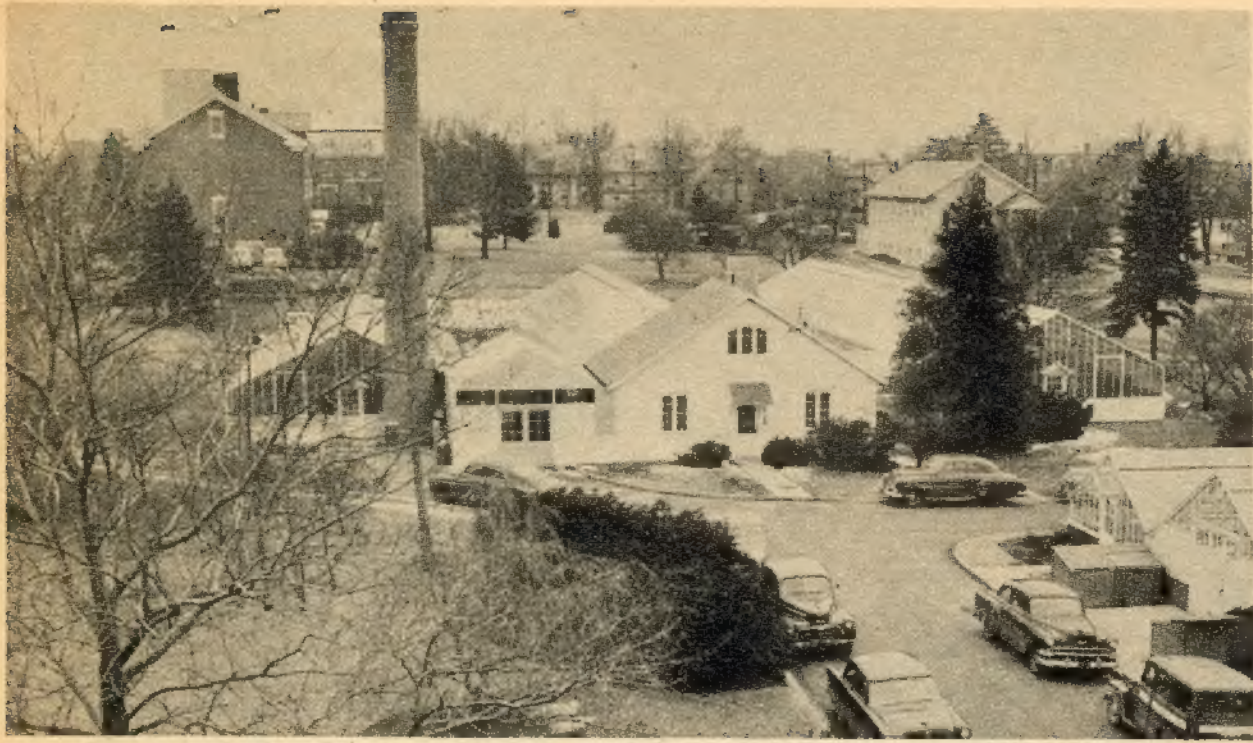
THIS year the Experiment Station marks its 75th anniversary. Lots of nice things will be said about the institution; Diamond Jubilees bring out the best in speakers. Still, the deepest appreciation may well come from thousands who won't have the

America's first project for the artificial insemination of dairy cattle.

Absorption with the past is the deadliest foe of research, however. Thus, as the New Jersey Experiment Station pauses to sum up 75 years it must look primarily to tomorrow. Dr. William H. Martin, director of the Experiment Station, sums it up this way: "Our farmers are breathing down our necks. They want information."

Dr. Martin—Bill Martin to thousands of New Jersey farm folk—holds in his hands a remarkable heritage. He is only the fourth director in the station's 75 years—and each director was personally chosen by his predecessor to carry on. That means that in spirit Bill Martin is to the first director what a great-grandson would be to his great-grandfather.

This is the sixteenth in a series of articles on New Jersey's highly diversified agriculture, vigorous and growing despite the constant inroads of industrial and residential development. Next week: The Extension Service.



campus at New Brunswick with floriculture greenhouse in foreground.

Research Helps Boost Incomes of Jersey Farmers Who Have Learned to Heed Findings of the Rutgers' Agricultural Experiment Station Now Observing Its Golden Jubilee

Perhaps the thing which has most distinguished the spirit from the start has been a willingness on the part of all directors to permit free research. That is never easy in a state institution; too often hard-headed taxpayers demand immediate returns—sometimes the bigger the taxpayer the more personal the service he demands.

YET without a willingness to permit free research, it's improbable that Dr. Julius Nelson would have been permitted to indulge in his incredibly important oyster research a half century ago. Without freedom to work it's unlikely that Dr. Selman Waksman's soil studies would have led to the discovery of streptomycin. Nelson and Waksman are but two of the great names symbolizing research at the New Jersey Agricultural Experiment Station.

Better to understand the station in 1955, go back to 1880, the year of its founding. Everywhere in New Jersey in 1880 the agricultural air was filled with one driving influence: Brilliant, kindly, practical, tactful, generous Dr. George H. Cook. Not one of those adjectives is undeserved; more could be added.

George Cook came off a Morris County farm (Hanover, to be specific) to gain a solid scientific education at Rensselaer Polytechnic Institute. He returned to New Jersey in 1853, at the age of 35, to become professor of chemistry and natural sciences at Rutgers. There he remained for the rest of his life. The year after his arrival at Rutgers, Dr. Cook also became assistant state geologist and in 1864 became state geologist. He held that post until his death, too.

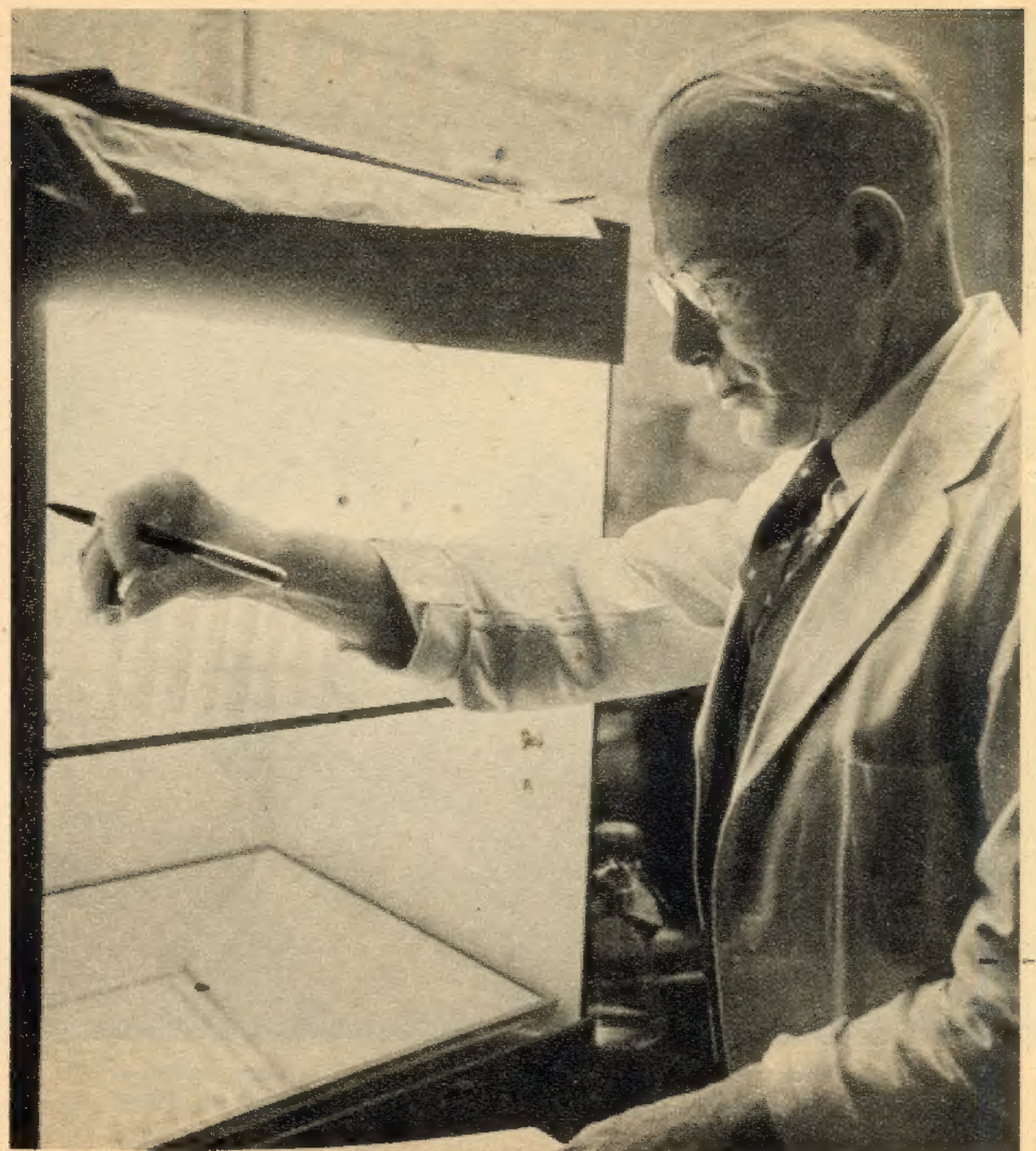
EVERYWHERE it became evident that the old methods of drop-the-seed-and-trust-to-nature had to be dis-

carded in agriculture. In 1862 Congress passed the Morrill Land-Grant act, allocating income from public lands to the states for higher education in "agriculture and mechanical arts." Who in New Jersey saw the possibilities for Garden State farmers? George Cook, obviously.

Thanks to Dr. Cook, New Jersey in 1864 became the third state to set up a college of agriculture, and thanks to him Rutgers became the site. The law provided for public education, a college farm and lectures in various parts of the state. Again, George Cook became responsible for everything—at the same time that he directed work on a complete geological mapping of New Jersey, a project so carefully done that the U.S. Geological Survey adopted it as a model. Conscientious Dr. Cook wouldn't rob the state; when he became director of the Agricultural College he asked for—and got—a cut in his geological pay.

Better than anyone else, Dr. Cook recognized that teaching of agricultural science bordered on the ridiculous without a solid background of experimentation. He went before the State Legislature in 1876 to plead for \$3,000 for an experiment station. The Legislature "fairly laughed at the idea." Four years later, however, the Legislature heard from enough straight-faced constituents down on the farm to establish the Agricultural Experiment Station. Generously (more or less), the state granted \$5,000 for the nation's fifth experiment station.

WORK began formally April 7, 1880, when Dr. Cook issued an announcement proclaiming that the station would work for all farmers—regardless of economic status. The station would do only such work as the



Dr. Fred R. Beaudette, noted for experiments with poultry vaccines, recording results of new tests to improve egg production.

farmer couldn't do for himself or couldn't afford to do. Experiments must benefit all sections of the state equally.

Geology pervaded much of Dr. Cook's busy life; it was but natural that his initial experimental emphasis should be on soil science. That emphasis remained a prime consideration for a full half century (and is still a prime consideration at Rutgers). Rutgers became world-acclaimed for its soil research, meanwhile probing during Dr. Cook's regime into many other areas—including, for example, the growing of cowpeas, millet, cotton, sorghum, tobacco and sugar beets.

Unexpected funds came under Dr. Cook's jurisdiction in 1888 as the result of the Hatch Act establishing federally financed experiment stations at state agricultural colleges. In theory New Jersey thus had two experiment stations; in practice the two operated as one. The extra funds permitted Dr. Cook to expand—and he personally selected and guided three new research men, Byron D. Halsted, Julius Nelson and John B. Smith.

ALWAYS, nevertheless, Dr. Cook showed greatest preference for young Edward B. Voorhees, the soil scientist who had joined the Experiment Station staff in 1883. Voorhees quietly picked up prestige and knowledge; he was ready for leadership when Dr. Cook died in 1889. Not as ready were the station's board of managers. It took them until 1893 to make official the appointment of Voorhees as director.

Probably nothing in Dr. Cook's long and useful life had greater impact on agriculture than his selection of the "Big Four": Voorhees, Halsted, Nelson and Smith. There is no questioning the fact that for a long time no quartet at any experiment station topped this Rutgers team in ability, imagination and perseverance.

Dr. Voorhees expanded the program of soil research, relating it particularly to long-range research designed to yield fundamental information rather than to solve an immediate problem on a particular farm. Always he struggled against permitting research to give in to unreasonable demands for immediate practical results. In that setting the Experiment Station grew in size and importance.

Individuals stood out. Dr. Smith, celebrated entomologist, pursued New Jersey insects with single-minded purpose. His work on the San Jose scale helped save the New Jersey peach orchards. Between 1890 and 1909 he published three catalogues, totaling 2,134 pages and containing upward of 10,000 insects found in New Jersey. If that wasn't enough to set all the state itching from Cape May to High Point, his pronouncement about mosquitoes was.

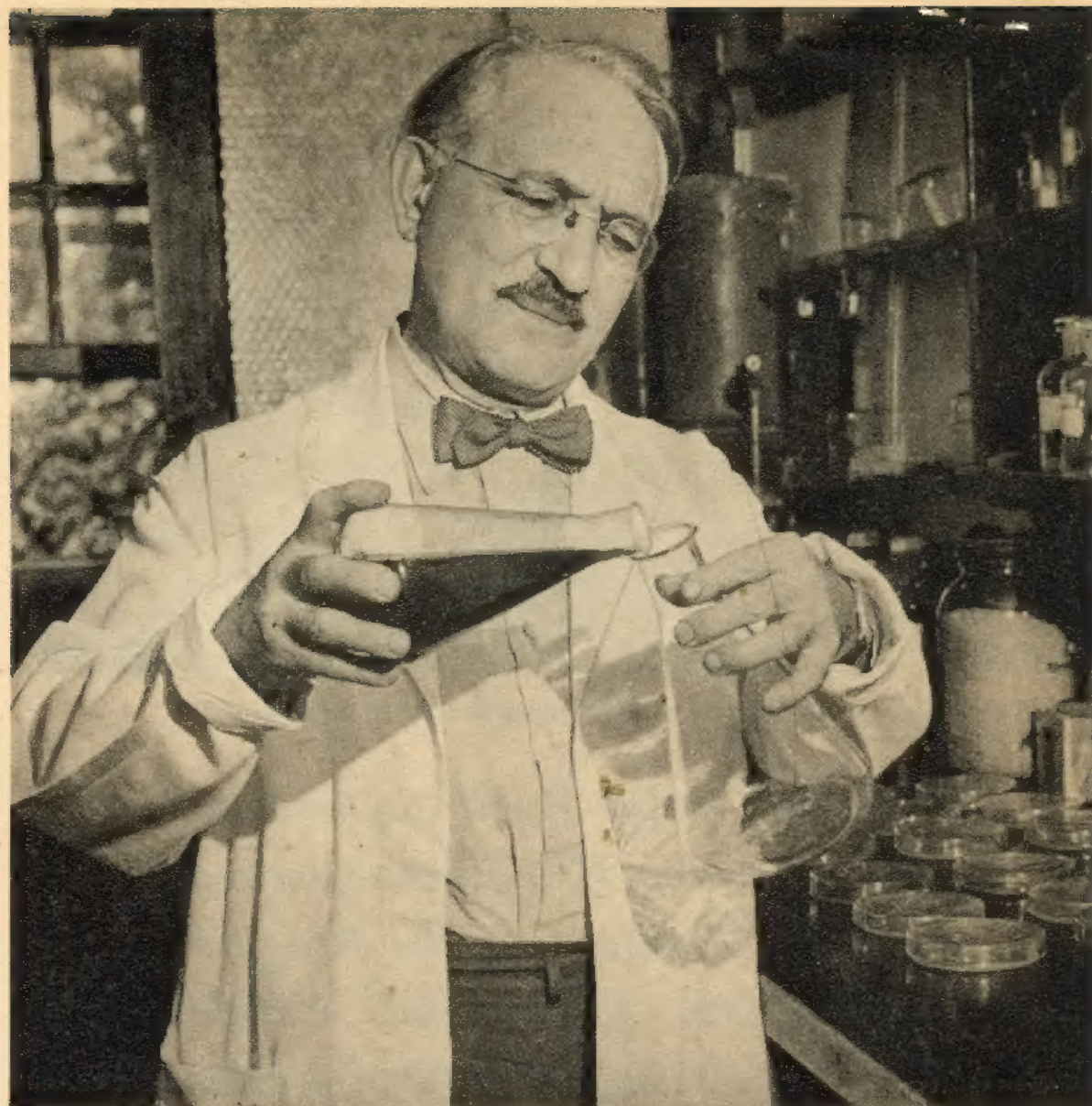
HAD Dr. Voorhees been thin-skinned about research, he would have called in this man Smith for stinging rebuke. Up and down the state went Smith, telling all and sundry that the Jersey Skeeter could be conquered. He appealed for state funds in 1901, citing tremendous property losses caused by

(Continued on Following Page)

JERSEY FARM SCIENTISTS



The man who made Rutgers University the soil science center—Dr. Jacob G. Lipman, agricultural dean until his death in 1939.



Dr. Selman Waksman, discoverer of Streptomycin, is one of the great names symbolizing research at the Agricultural College.

(Continued From Preceding Page)

the mosquito along the shore and even in the fine hills of North Jersey. Most legislators laughed and laughed (an old Jersey legislative habit) at the man who tilted lances with New Jersey's most famed gladiator.

The next year Dr. Smith scratched \$10,000 from the state and set out to drain the salt marshes. A few towns (notably South Orange and Elizabeth) co-operated, but most other areas went on chuckling—and slapping. Dr. Smith didn't fully defeat the Skeeter, mainly because funds always lagged—but thanks to the indomitable Rutgers entomologist, the mosquito at least came under reasonable control.

As Dr. Smith learned about mosquitoes and their secrets of breeding, Byron David Halsted devoted his every waking moment to the study of plant habits. Happy, excited with his work, Dr. Halsted "presented research as an exciting sport." His work with microscopic studies of plants won him an enviable reputation, but his greatest contributions came when his eyesight failed and he turned from the microscope to plant breeding.

OCCUPIED at first with the very practical subject of weeds (the title of his first bulletin in 1889 asked farmers, "What Are the Worst Weeds of New Jersey?"), Dr. Halsted ranged far afield—figuratively and literally. He investigated plant diseases, sought fungicides, tried to develop new plant varieties.

Plant breeding—an acknowledged Rutgers specialty wherever agriculturists gather—got its impetus at the New Jersey Experiment Station in

1898. That year Dr. Halsted began crossing varieties of sweet corn. Then he crossed varieties of tomatoes, beans, cucumbers, eggplants—anything with enough plant vitality to get interested in others of its species.

Credit Dr. Halsted with getting under way a breeding program which ever since has made the New Brunswick Station noted. Maurice Blake, who arrived on campus in 1906 to work with Dr. Halsted, achieved international success in breeding peach varieties. Lyman G. Schermerhorn, who arrived in 1914 (four years before Dr. Halsted's death), picked up the tradition and eventually contributed the marvelous Rutgers tomato in 1934.

SMITH and his bugs, Halsted and his plants, Voorhees and his soil. Round out the "Big Four" with Julius Nelson, the biologist who helped save the American oyster industry. Dr. Nelson achieved other successes—in experiments with bovine tuberculosis and studies in egg production by virgin fowls—but the oyster was his pearl.

Dr. Nelson first opened oyster inquiries in 1888 and pursued his inquiries until his death in 1916. At first many an agricultural eyebrow was raised, but Dr. Nelson persisted in his cheerful but pointed manner, which won him friends and left no doubt that oysters WERE a farm item—and that's that.

Early experiments centered in Raritan Bay, but after 1901 work shifted to South Jersey where it belonged—first to Tuckerton, then in 1923 to Bivalve in Delaware Bay. Dr. Julius Nelson's work saved the oyster industry, no questioning that, and

thanks to him oysters are in season all over the nation. Ever thorough, ever persuasive, Julius Nelson left a capable man to carry on—his son, Dr. Thurlow Nelson, still associated with oyster research.

THIS matter of leaving a capable successor has been a shining light at the Experiment Station. It went all the way to the top. Dr. Cook chose Dr. Voorhees and when Dr. Voorhees died in 1910, he had lined up as a successor one of New Jersey's noblest farm figures—Jacob G. Lipman.

Only in America could there have been a Jacob G. Lipman. A Jewish refugee from Russia, he learned his farming at the Baron de Hirsch Colony in Woodbine, Cape May County. College for a poor boy? Sure, if he would get up at 4 a.m. and milk cows on the Experiment Station farm. Sure, if he wanted to struggle. Jacob Lipman did.

Dr. Voorhees admired this young man with a will who had found his way through Rutgers. He summoned him in 1901 to establish the world's first department of soil chemistry and bacteriology. Building on the soil enthusiasm of Cook and Voorhees, Lipman made Rutgers the center of all soil science. No one wondered who might succeed Voorhees; it had to be Jacob Lipman.

DR. LIPMAN served as director of the Agricultural Experiment Station for 28 years, until his death in 1939. The college "farm" (where college and station both stand) expanded greatly, from 142 acres to more than 700 acres. Eight of the 10 major buildings on campus were built during his regime. The Experiment Station ex-

panded from seven departments to 22 while he served.

Statistics might go on and on, but they lack warmth or spirit. Dr. Lipman bridged the gap between the old farmer and the new, between the horse and buggy era and the tractor and Cadillac age. In 1911 farmer apathy about science was widespread. Dr. Lipman helped bring home to the farmer that Rutgers was for his good, was to be both used and respected. Research became more intense—and no one questioned an occasional sortie into what might have appeared to be unlikely agricultural area.

THIS Lipman Age was the time when Maurice Blake brought his peach research to fullest flower, when Lyman Schermerhorn carried on the research which led to the remarkable Rutgers tomato variety, when Fred R. Beaudette began his noted experiments with poultry vaccines, when John Bartlett began exceptional studies in improvement of Holstein butterfat output, when Enos J. Perry brought to New Jersey the first co-operative artificial insemination project in America.

All these—and scores more—labored at New Brunswick. Always they worked with the philosophy that what they accomplished was good first of all for New Jersey's farmers. Peach varieties, vegetable varieties, poultry practices, dairy science—all had a strong Jersey angle, perfected for New Jersey's highly varied topography, its varying soils, its diversified agriculture. If other areas could use Rutgers developments—and they could, often—fine, but the state's farmer stood first.

One of Dr. Lipman's prides was a



Dr. Lyman G. Schermerhorn, whose contribution was the marvelous Rutgers tomato in 1934, inspecting a fruitful new plant.

researcher named Bill Martin, one of the nation's foremost experts in potato growing. Mr. Cook chose Mr. Voorhees, Mr. Voorhees chose Mr. Lipman, and Mr. Lipman, in turn, chose Mr. Martin as a successor. Mr. Martin moved up to become director of research in 1935, after 20 years on Rutgers campus. In 1939 he succeeded Dr. Lipman as dean of the College of Agriculture and director of the Agricultural Experiment Station.

THIS seems a good point to explain the college and station relationship. The college is the teaching arm, the station the research arm—and for all practical purposes, they are one and the same since most professors are researchers and vice versa. Good teaching depends, of course, on good up-to-date material and top-notch scientific inquiry. Dr. Martin is dean of the college, director of the Experiment Station and director of the Extension Service (whose work will be explained in the next article in this series).

Dr. Martin's role as the fourth director of the Experiment Station is clearly defined. It is to guide agricultural research through the current rapidly changing paths of the New Jersey agricultural maze. It is to help the farmer find solutions to distressing marketing problems, to troublesome storage problems, to losses from insects and fungi, to full utilization of vacant land. The high skill of farming today calls for ever more research, not less.

"I think we should have more men working on fundamental research," Dr. Martin says. "We spend a lot of time answering specific questions, and that's necessary. But fundamental re-

search is vital. You never know where that will lead."

EXAMPLE number one at Rutgers of "not knowing where research will lead" is the discovery of streptomycin. That came out of the soil, out of research Dr. Waksman did long ago on actinomycetes in the soil. That fundamental research, started in 1915, came to the fore in 1943, when Dr. Waksman and his associates isolated the marvelous antibiotic, streptomycin. It's justice that the absorption of Cook, Voorhees and Lipman with the soil should have led directly to the new wonder drug; it's also important to note that industry has spent more on buildings to manufacture streptomycin than the entire Experiment Station research program has cost in 75 years!

Another example in recent years of "sideline" benefits is found in the work Dr. Beaudette has done in poultry pathology. A noted developer of poultry vaccines, Dr. Beaudette was hastily summoned to a factory on the edge of Denville during World War II to find why canaries raised in the building were dying of "gasping sickness." Dr. Beaudette developed a vaccine and saved the Denville canaries—vital in antimalarial research because they were then the only disease-free canaries in the nation.

Dr. Beaudette can also be credited with most of the basic research on a vaccine for the dreaded Newcastle poultry disease. Newcastle struck New Jersey chickens during the war years and Dr. Beaudette was soon ready with a vaccine. Today Rutgers-perfected vaccines save an estimated \$150,000,000 annually for United States poultry farmers.



Dr. John W. Bartlett, dairy department head who is famous for Holstein cattle work. **BELOW:** Dairy barn is part of campus.



Poultry, as New Jersey's biggest farm industry, naturally commands a great deal of time and attention at the Experiment Station. In the near offing is a new poultry building, where the work will be intensified. Here, too, the horizons seem unlimited. Who knows, for example, but that some intensive research now being done at Rutgers on the chicken's circulatory system may hold some clues to high blood pressure and hypertension in humans?

Probably the outstanding new development at the Experiment Station in recent years has been a fungicide called SR406 (or Captan, as it is known commercially). SR406 has been a joint project of Standard Oil Co. and Rutgers (hence, SR). The number 406 means it was the 406th compound tested.

Number 406 hit the fungicide jackpot. Quite by accident, too, since chemist Allen R. Kittelson one day in 1946 borrowed a flask containing a liquid of no known value at Esso Research Labs in Linden. He sent it on to Rutgers, labeled 406. Dr. Robert H. Daines tested 406, as he had 405 and everything else back to 1, but this time the liquid had magical powers. It is being hailed as a miracle, after eight years of careful checking and rechecking at Rutgers. One thing New Jersey apple growers found out

last fall—their apples and trees had never looked better. They give much of the credit to SR406.

IT'S unfair, in a way, to single out a few nationally known examples of success. Work goes on elsewhere at the Experiment Station. Work on minor elements such as boron in the soil—and without boron, alfalfa would not grow as extensively as it now does. Work on grass silage, one of the station's prime reasons for taking repeated bows. Work on new fruit and vegetable varieties. Work on chickens and dairy cows. Work on corn hybrids, on sweet potato varieties.

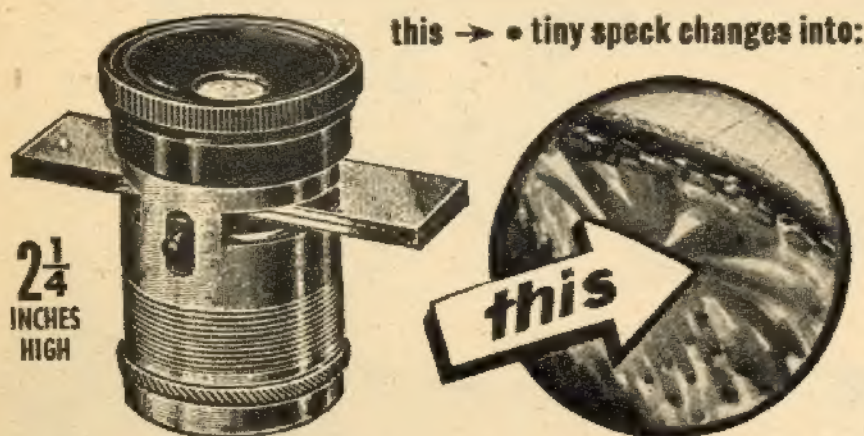
Linger on the sweet potato a moment. New Jersey sweet potato sales are up at a time when national sweet potato sales are down drastically. One reason is a new variety—the firm dry Jersey Orange pushed by Rutgers specialists. Another reason is new storage techniques, developed jointly by Rutgers and growers.

Storage means sweet potatoes can be marketed over long periods of time. Rutgers researchers insisted sweet potatoes should be stored in high humidity and low temperatures—exactly opposite the long-accepted standard practice. A group of Hamonton growers built such a shed, and despite some rocky moments

(Continued on Following Page)

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FARMER SCIENTISTS

(Cont'd from Preceding Page)
when they threatened to tear off the roof as water dripped over their crop, the growers found to their joy that their sweets kept perfectly in the new facility.

REGARDLESS of the research, it is valuable only to the farmer when it reaches his hands. Rutgers tends to be sure before it recommends any new disease-killer or farming practice. Occasionally farmers storm the station doors, asking why this magazine or that magazine has articles on new farm wonders when Rutgers won't recommend them? Not long ago many potato farmers used a new technique—against Rutgers recommendations—and all but ruined their potatoes.

Today research at Rutgers is spread through 28 departments, covering every conceivable range of New Jersey agriculture. The last six created—forestry, microbiology, meteorology, food technology, wildlife and animal pathology—help show how far afield agriculture now goes. Anything needed by the state's agriculturists is certain to find a department capable of seeking an answer; some 225 active research projects are now being pursued in the station.

It is difficult, if not impossible, to say Experiment Station research is costly—last year it cost state taxpayers only about \$1,150,000. Another \$250,000 for research came from federal funds and more than \$300,000 came from research grants allocated by private firms for specific purposes. Take the total of about \$1,700,000 for the Experiment Station, weigh it against New Jersey's annual \$400,000,000 gross farm income. Thus, less than 1/2 of 1 per cent of farm income is allocated for research; it's not uncommon for industry to figure 5 per cent of gross income as a reasonable research figure.

Ahead are difficult days for some segments of Garden State agriculture, occasioned partially by ever-changing farming techniques, partially by the growing urbanization of the state, partially by tremendous marketing problems. The successful farmer must now farm more with his brain than his feet, must harvest with his head as well as his combine. That's where the Experiment Station, 75 years old and as buoyant as an adolescent who's just found where he's going, stands ready to help.